FINAL 26-Apr-05

Fermilab

Closeout Report

from the

Director's Review

of

Run IIb D-Zero Detector Upgrade Project - AFEII

April 13-14, 2005

Table of Contents

Introduction

A Director's Review of the Run IIb D-Zero Detector Project - AFEII was held on April 13-14, 2005. The committee was charged to assess the current progress on the AFEII design, technical issues, Cost estimates, the proposed schedule and the management of the AFEII project. The charge contained a list of questions that the committee was to address to determine if the AFE II Project should be recommended for approval or not. The assessment of the Review Committee is documented in the body of this report.

Reference materials for this review are contained in the Appendices. The Charge for this review is shown in Appendix A. The review was conducted per the agenda shown in Appendix B. The Reviewer's assignments are noted in Appendix C and their contact information is listed in Appendix D. The Review Participants are listed in Appendix E. Appendix F is a table that contains all the recommendations contained in the body of this report.

Answers to Charge Questions:

1 Is there a clear performance specification for the AFE II devices?

Findings:

- The proponents made strong technical presentations on the design, testing and operation of the AFEII module with the TriP-t chip. The draft board specifications document "D0 CFT AFEII Analog Front End Board" was made available to the committee.
- There is a consensus between the project leaders, the engineers and physicists studying system performance on the general specification of the devices. This general specification states that the AFE II design should address the performance limitations of the existing system while remaining pin compatible with the AFEI design. The stated performance limitations are (roughly decreasing order of importance):
    1. Saturation of the SVX II chip resulting from multiple crossings between resets (12 xings),
    2. Cross-talk from discriminators into analog readout,
    3. Tick-to-tick (beam crossing to beam crossing) pedestal variations,
    4. Channel to channel pedestal variations,
    5. Baseline shift from discriminator firing causes different effective threshold in following crossing.

  In addition, the system is currently limited to a readout rate of 40 MHz compared to a design specification of 53 MHz. Finally, the next version of the AFE II is intended to include timing information in the readout but no explicit specification of the performance was provided.

Comments:

- It is clear that the proponents understand many of the specifications needed for the TriP-t chips and the AFE II modules and can speak to the issues involved. Although there is consensus on the general specification, there are not clear performance specifications for the new design other than the requirement for readout to operate at 53MHz.
- Neither a summary list of the current TriP-t specifications nor a detailed specification document for the chip was presented to the committee. "Relevant D0 Notes" contained documents that contained many chip descriptions, test results and specifications.
- The board specifications draft document "D0 CFT AFEII Analog Front End Board" is a good beginning but relies on the reader knowing the AFEI design. It contains some detailed specifications, and it is very complete in how the AFEI design would be modified to become the AFEII. However,

the list of board specifications is lacking many details. For example, the A2D converter part number is given early in the document but the operational specifications were never given. What is the AFEII digitization requirement for resolution and speed?

Recommendations:

1. The committee recommends that a clear set of prioritized performance requirements be agreed upon by the project management immediately. These requirements should be driven directly by the physics requirements of the experiment and be easily measured on a teststand. This should be a short document (of order 1 page) which it should be easy to assemble from existing documentation. Without this set of requirements it will be difficult to evaluate whether the design is complete or not. These requirements can be used by the project management to set boundaries between modifications that must be made and those that fall in the “it would be nice” category. Given the very tight schedule it is imperative that only the required design modifications be made.

2 Is the case that the physics output from the detector will be enhanced by the introduction of the AFE boards if they perform up to this specification strong and convincing?

Findings:

- D-Zero presented details of the detector performance degradation anticipated at high instantaneous luminosity for continued use of the AFE-I system, culminating in the loss of physics output associated with b-tagging, and sensitivity to top and Z-Higgs cross sections. The dominant source of this identified loss of physics reach is the saturation effect in the SVX response. The AFE-IIt alleviates this effect by resetting after every beam crossing.

Comments:

- The Committee was particularly struck by the chance to regain most of a 33% loss in effective luminosity for top and 40% loss for Z-Higgs.
- In spite of a lack of precision in the performance specification, the Committee believes that the physics case is "strong and compelling" if the AFE-IIt upgrade can be made on the time scale as presented. Were this the case, two full years of the highest luminosity running would benefit from use of the AFE-IIt.
- The Committee noted that not all the engineering changes presented are required to achieve the main improvement indicated above.

Recommendations:

1. The MC studies of top and Z-Higgs should be redone quickly, and separately with each of the important performance degradations, some of which would be alleviated by a new AFE-IIt. We are thinking in particular of separately quantifying the gains from resetting every crossing, degradation of light yield, and low VLPC gain. This should help focus attention on only those changes which have sufficient physics return for the effort and time required to make the implementation.

3 Is the R&D work sufficiently well advanced to judge whether there is a reasonable chance of the devices working to specification? If so, does the committee judge that the devices will work to specification?

Findings:

- The design team has accomplished a significant amount of R&D on this project to get the project to this point.
- Testing on the prototype AFEII modules with TriP chips is complete except for the discriminator LVDS readout and the analog data readout.
- Chip testing on the TriP-T prototypes is well along with very encouraging results

Comments:

- The untested readout functions on the prototype AFEII modules are key functions for the project and need to be tested before the module design is completed and production is started. All the other functions on the module were tested and operate with no problems or with understood and readily solvable problems.
- Lack of clear specifications hinders the committee's evaluation of the value of solving each the AFEII module problems. However the enthusiasm of the proponents clearly indicate that most functions on the new module are satisfactory or can be solved readily except for two, the analog data readout speed, which is untested, and the clock distribution on the module, which has measured skew. Depending on the requirements and schedule, the clock skew may have to be tolerated due to the amount of time and effort it would require in redesign. The project must evaluate the test results of the analog data readout speed relative to the project requirements.
- The changes to the Trip-t chip design are understood, in progress and not on the critical path.

Recommendations:

1. The module and chip requirements should be defined as recommended in item 1 above.
2. Testing of the prototype modules must be completed as soon as possible.
3. The prioritized list of design changes for production should be reviewed and pared as much as possible and implemented as soon as possible to ensure that the production schedule can be met.

4 Is the cost estimate for the project well developed and reasonable, does it appear to fit within the constraints?

Findings:

- The collaboration presented an updated cost estimate after a recent update to the AFE-IIt project plan. The total project equipment cost is $1.32M plus 0.495M (38%) contingency.
- The collaboration presented a WBS for the AFE-IIt project as part of the D0 Run IIb upgrade. Cost estimates were presented for four level 3 items: Prototype – AFE-IIt, TriPt, Full Board Set (AFE-IIt) Production and Test, and Code Development.
- The collaboration presented estimates for labor required broken down into engineering, technical, and physicist. Names are identified for each WBS task and that labor is accounted as part of the equipment cost and contingency.
- The marginal cost to produce an additional AFE-IIt board was quoted at approximately $2500.

Comments:

- The cost estimates for M&S and labor are reasonable and even less than original estimates made during the rebaselining. Thus, the cost estimate is judged to fit within constraints.
- Cost estimates are based upon vendor quotations and previous experience for contracting similar work with the AFE-I project and with the AFE-II prototype. Contingency estimates ranging between 20% and 50% for M&S and 50% for labor are reasonable.
- The scope of WBS 1.7.6, Code Development, is confusing and should be clarified to identify those tasks that are on project.

Recommendations:

1. The collaboration should increase contingencies to include a possible 2nd submission of the Trip-t chip in case of a problem with the submission. In addition, costs and/or contingencies should be increased to allow for flexibility to speed procurement orders. Particular emphasis should be placed on realizing the first tested AFE-IIt prototype board.
2. The collaboration should develop a production plan quickly. In particular, consideration should be given to a plan that calls for the production of a much larger number of AFE-IIt boards. With a larger number of boards

started, there would be more boards produced that require virtually no re-work.

Contingency Table Recommendations:

3. The committee recommends the following changes to the delineation of the required amount of contingency for the AFE IIt project. First, on the M&S associated with the TriP-t production, the contingency should reflect the full cost of a potential re-submission in the event there is a layout flaw that requires re-fabrication. This re-submission is thought to cost $250K. Second, on the M&S associated with the entire AFE-IIt boards, a contingency of approximately $250K should be added to accommodate a possible change in strategy whereby an additional 100 boards are purchased in order to reduce the re-work required to realize 203 AFE IIt boards ready for installation.
4. The committee also encourages sensible use of contingency funds to speed up certain procurements especially those involved with realizing the first AFE IIt prototype.

With these changes, it is noted that the cost plus contingency is very nearly equal to the original estimates.

		Project's Cost Estimate in AY$ w/Indirects				Projects Cost Estimate in AY$ w/Indirects			
WBS	Task Name	Base	Average % Cont.	Cont.	Total (Base+ Cont.)	Base	Average % Cont.	Cont.	Total (Base+ Cont.)
1.7	***AFE II/TriP***	1,319,706	37%	485,757	1,805,463	1,319,707	63%	833,846	2,153,553
1.7.3	Prototype - AFE II t	35,230	39%	13,804	49,034	35,230	39%	13,804	49,034
1.7.4	TriPt	297,111	47%	139,075	436,186	297,111	97%	288,198	585,309
1.7.5	Full Board Set (AFEIIt) Production and Test	954,038	33%	314,120	1,268,158	954,038	54%	515,181	1,469,219
1.7.6	Code Development	33,328	50%	16,664	49,992	33,328	50%	16,664	49,992

5 The project will be a sub-project of the D0 Run IIB Upgrade Project. Please assess the schedule for the sub-project in the context of the pre-existing completion dates and Critical Decision dates for the D0 Run IIB Upgrade Project.

Findings:

- The current AFE II project is predicted by the D0 Run IIb Upgrade Project to be finished on April 14, 2006. D0 suggests that a Director's Milestone date of July, 2006 be adopted.
- They note that CD4 is November, 2006.
- The April 14, 2006 date for AFE II "203 Boards Ready" has no contingency. A 4 week contingency is possible if Vendor Qualification of AFE II production is deemed unnecessary.

Comments:

- Changing the schedule with a new Director's Milestone in July, 2006 may be a major baseline change.
- A contingency generated by removing a task does not seem like contingency.

Assessment:

- The AFE II project is extremely unlikely to be done by April 14, 2006.
- Even the suggested Director's Milestone date of July, 2006 may be risky.
- The July date is being treated as if it is 3 months of contingency on the project. It is not clear that is the proper way to do this.
- It is not clear the project would be complete by July, 2006 either.

Recommendations:

- The committee believes the AFE IIt needs essentially full time L2 managers – the current L2 managers could shed most of their other responsibilities, or perhaps another senior person could join the management to fill in the gaps. The management needs to focus strongly on their task – you are nearly out of time to complete this project and people have to be thinking full time about how to limit the project to the essentials and how to execute the production and testing quickly. Every shortcut has to be explored. At this point you may have to throw money at the problem, not look for ways to save money.

6 Has the engineering team to build these devices been identified?

Finding:

- The team to design, build and test the modules has been identified and is operating well at this time. Module testing is on the critical path.

Comment:

- Most of the engineering team is also identified as resources for testing and installation activities. Some installation activities will require specific engineering resources initially provided by members of the engineering team.

Recommendation:

1. The installation activities should have additional resources available so that installation tasks have minimal impact on testing. Additional collaborators should be recruited and trained for installation and commissioning tasks to ensure the testing schedule is met.

7 Is there a team identified which will:

a Take ownership of the project within the collaboration?

c Take responsibility for the preparatory work needed to ensure the prompt commissioning of these devices as needed?

Findings:

- Until rather recently, the work on the AFE-IIt R&D has been dominated by the Fermilab engineering efforts. More recently, the group from Notre Dame has accepted significant responsibility for major aspects of the project.

Comments:

- The Committee expects that once the collaboration is made aware of the physics studies presented in this review, more of the collaboration may be expected to appreciate the power of the AFE-IIt upgrade project, and more of the additionally required effort could come from a collaboration more fully taking interest and ownership in the project.
- Given the scope of the work required and the short time available to complete the commissioning of the system, additional physicist effort would be very beneficial. In particular getting more physicists directly involved in the testing activities during the prototype and preproduction phases will provide good training for later work installing and commissioning the system.

Recommendations:

1. Present the most recent studies of the potential physics gains associated with the AFE-IIt to the collaboration in a most visible forum, and seek the commitment of at least one additional group to bring the project to fruition in a timely way. Earlier and additional physicist involvement in testing, installation, commissioning, and tracking codes would benefit each of these areas - particularly in assuring timely benefit from the AFE-IIt.

b Work with the Fermilab (and other?) engineering to ensure that the preparation for commissioning is taken in hand?

Findings:

- The Fermilab technical team is in place with a good understanding of the details of testing and installation.
- The project is developing a plan for mixed commissioning with AFEI and AFEII modules. A detailed plan for this technical commissioning and integration was not presented.
- Online software and databases modification tasks needed for installation and commissioning are understood and experienced Notre Dame resources are committed to making those changes.

Comments:

- The details of the differences between the AFEI and the AFEII are needed to complete the changes to the online software and databases that will allow for mixed system running. This software is scheduled to be completed before the planned platform test of preproduction boards in the fall of 2005.

Recommendation:

2. The technical team should provide the specific module difference information to the software team as soon as possible.
3. The D0 SCIPC committee should review the AFEII commissioning plan as soon as possible to ensure that the project has the resources necessary for installation and commissioning.

8 Is there a commissioning plan which addresses the engineering commissioning and the integration and physics commissioning of the new devices and all the affected triggers?

Findings:

- A general plan for technical commissioning and integration was presented. The plan takes advantage of the "plug compatibility" of the AFE II with the AFE I boards. Initial integration and commissioning would only readout the pulse height information currently available on the AFE I. The timing readout would be commissioned when the system is ready.
- Two different installation strategies were presented. In the adiabatic approach, sets of 16 boards would be installed when they become ready for installation. Each set would require an access of less than 8 hours to install, test, calibrate and enter into the database. Would take several months of accesses approximately once per week and could start as soon as a minimum number of boards are ready. The second option is to do a mass installation once all boards are ready for installation. It is expected that this would require a shutdown of approximately 2 weeks duration.
- A detailed plan for this technical commissioning and integration was not provided. The physics commissioning plan was not presented.

Comments:

- The general plan of taking advantage of the plug compatible nature of the AFE II to stage the commissioning is an excellent choice. The only software required to operate the existing readout information is that required to download configuration parameters via slow control and to operate calibrations. This software is scheduled to be completed before the planned platform test of preproduction boards in the fall of 2005.
- Much of the performance improvement expected from the AFE II should be available in the early phase of operation and with minimal commissioning. Since saturation effects and pedestal shift effects should all be removed just by switching boards. Only the improvements from adding timing information require the full system commissioning.

Recommendations:

1. Emphasis should be placed on verifying that the AFE II prototypes are truly plug compatible with the AFE I boards. The ability to operate the system with mixture of boards will provide important flexibility in commissioning the system.

2. A plan for physics commissioning of the timing readout should be developed including detailed prioritization of the software tasks required for completion.

9 Please evaluate the relative risks of building and not building the AFE II devices, installing and not installing those devices.

Evaluation:

I. Assume the devices are NOT built.

- It seems clear that the experiment would effectively lose integrated luminosity for t tbar (33%) and ZH (40%) events. These losses are magnified by studies of states where one demands TWO b-tags instead of only one. This always shows the biggest effect and is always chosen by the proponents.
- The actual loss will depend on the peak instantaneous luminosity at the beginning of stores. Eventually the luminosity falls to a level where the loss is not as large. Luminosity leveling might compensate – that would take a request from the experiment.

II. Assume the devices are built.

(a) They could be unsuccessful, lose luminosity anyway.

(b) They could be so late that DOE must be involved and the project is deemed so late that it requires high level attention. This may be worse than losing luminosity?

Sub-questions:

(c) Built and Installed.

1. They could be hard to commission and the experiment could lose integrated luminosity anyway.

2. They could be a resounding success and rescue the D0 tracker for high luminosity.

(d) Built but Not Installed.

1. Waste of funds and effort, lose luminosity anyway

- Counting the possible outcomes, one finds 5 ways to lose and 1 way to win.

- Is the potential “win” worth doing this?

  Yes, but only if it can be done on time within the existing project milestones.

10 Taking into account the above considerations and others as appropriate, does the committee recommend that the AFEII project be approved?

Comment:

- The potential benefit from implementing the AFEII project is significant at a modest cost. The schedule is the most serious outstanding question. DZero and the AFEII team must make some hard decisions to limit the additional changes to only those that are required, focus management efforts on the transition from R&D to production and place a great deal of emphasis on schedule performance in order to deliver on the proposed schedule.

Recommendation:

1. In light of the potential benefit, the committee recommends that the Fermilab Directorate seriously consider approving the AFEII project. Should it be approved, progress should be closely monitored and appropriate steps, if possible, should be implemented to keep the project on schedule. A natural time to take a close look at progress will be in July or August after some tests of the prototype boards have been performed.

Appendix A

Review of D0 AFEII Project

Mont,
9/30/2004

Context

The readout of the D0 Scintillating Fiber Tracker, often referred to as the CFT, is accomplished using a complex board called the Analogue Front End. This board conditions the signals coming from the Visible Light Photon Counters(VLPCs). It produces two sets of digital output, one of which goes to the fiber tracker trigger. The signals are also encoded using ADCs. There are approximately 200 boards of about four different flavors.

The boards operate with 396 nsec bunch spacing. However the original specification targeted operation with 132 nsec bunch spacing. Because the board would not support this spacing a redesign including the redesign of some of the key integrated circuits was started and is well advanced. In the course of that development, enhancements in capability have been introduced to the new design.

The proponents believe that completing this work and building a complete set of replacement boards will significantly improve the physics performance of D0.

This case was not in hand at the time of the rebaselining of the project in Fall 2003. The funding associated with this project was ring-fenced pending the R&D and a clear and convincing proposal. It was clearly understood that the case should include arguments which are carried through to physics discussions.

D0 is now well advanced with the preparation of the relevant chips and has prepared the proposal to include the AFE II boards in the Run IIB Upgrade Project.

Meanwhile, the performance of the Tevatron complex has produced peak luminosity in excess of $1\ 10^{32}\ cm^{-2}sec^{-1}$ during the summer of 2004. The committee should assume that the complex will achieve the performance characterized by the Design Goals of the Run IIB

Charge

The committee is asked to consider the following questions:

- Is there a clear performance specification for the AFE II devices?
- Is the case that the physics output from the detector will be enhanced by the introduction of the AFE boards if they perform up to this specification strong and convincing?
- Is the R&D work sufficiently well advanced to judge whether there is a reasonable chance of the devices working to specification? If so, does the committee judge that the devices will work to specification?

- Is the cost estimate for the project well developed and reasonable, does it appear to fit within the constraints?

- The project will be a sub-project of the D0 Run IIB Upgrade Project. Please assess the schedule for the sub-project in the context of the pre-existing completion dates and Critical Decision dates for the D0 Run IIB Upgrade Project.

- Has the engineering team to build these devices been identified?

- Is there a team identified which will:

    - Take ownership of the project within the collaboration
    - Work with the Fermilab (and other?) engineering to ensure that the preparation for commissioning is taken in hand.
    - Take responsibility for the preparatory work needed to ensure the prompt commissioning of these devices as needed?

- Is there a commissioning plan which addresses the engineering commissioning and the integration and physics commissioning of the new devices and all the affected triggers?

- Please evaluate the relative risks of building and not building the AFE II devices, installing and not installing those devices.

Overall:

Taking into account the above considerations and others as appropriate, does the committee recommend that the AFEII project be approved?

Appendix B

Director's Review of the
RUN IIb D-ZERO DETECTOR UPGRADE AFEII
APRIL 13-14, 2005

AGENDA

Wednesday, April 13 (Farside Meeting Room in D0 Trailer)

08:30-09:00 30m	Executive Session	E. Temple
09:00-09:10 10m	Project Manager's Viewpoint	V. O'Dell
09:10-09:20 10m	Overview	A. Bross
09:20-09:50 30m	AFE I Shortcomings and Solutions	J. Estrada
09:50-10:35 45m	Status of the AFE II	P. Rubinov
10:35-10:45 10m	BREAK	
10:45-11:15 30m	TripT Status	L. Bellantoni
11:15-11:55 40m	Physics Implications	M. Hildreth
11:55-12:25 30m	AFE II Cost and Schedule	A. Bross
12:25-12:40 15m	Spoke's Viewpoint	J. Blazey
12:40-13:40 60m	LUNCH	
13:40-	Executive Session Report Write-up	E. Temple

Thursday, April 14

08:30-10:00	Dry Run (Comitium - WH2SE)	E. Temple
15:00-	Closeout (Racetrack WH7X)	

Appendix C

	BODY OF REPORT?	
	Technical (Physics / Electronics)	Appel, Wilson
	Cost	Pavlicek
	Schedule	Wester
	Management	Cooper
	ANSWERS TO QUESTIONS	
1	Is there a clear performance specification for the AFE II devices?	Wilson, Pavlicek
2	Is the case that the physics output from the detector will be enhanced by the introduction of the AFE boards if they perform up to this specification strong and convincing?	Appel, Wilson
3	Is the R&D work sufficiently well advanced to judge whether there is a reasonable chance of the devices working to specification? If so, does the committee judge that the devices will work to specification?	Pavlicek, Wester
4	Is the cost estimate for the project well developed and reasonable, does it appear to fit within the constraints?	Wester, Hoffer
5	The project will be a sub-project of the D0 Run IIb Upgrade Project. Please assess the schedule for the sub-project in the context of the pre-existing completion dates and Critical Decision dates for the D0 Run IIb Upgrade Project.	Cooper, Wester, Hoffer
6	Has the engineering team to build these devices been identified?	Pavlicek
7	Is there a team identified which will:	
A	Take ownership of the project within the collaboration	Appel
B	Work with the Fermilab (and other?) engineering to ensure that the preparation for commissioning is taken in hand.	Pavlicek
C	Take responsibility for the preparatory work needed to ensure the prompt commissioning of these devices as needed?	Wilson
8	Is there a commissioning plan which addresses the engineering commissioning and the integration and physics commissioning of the new devices and all the affected triggers?	Wilson
9	Please evaluate the relative risks of building and not building the AFE II devices, installing and not installing those devices.	Cooper
10	Taking into account the above considerations and others as appropriate, does the committee recommend that the AFE II project be approved?	Temple

Appendix D

DIRECTOR'S BASELINE REVIEW OF THE DZERO AFEII PROPOSAL
April 13, 2005

Reviewer Contact List

Jeff Appel
Fermi National Accelerator Laboratory
M.S. 122
P.O. Box 500
Batavia, IL. 60510
630-840-3922
appel@fnal.gov

John Cooper
Fermi National Accelerator Laboratory
M.S. 208
P.O. Box 500
Batavia, IL. 60510
630-840-2235
jcooper@fnal.gov

Dean Hoffer
Fermi National Accelerator Laboratory
M.S. 200
P.O. Box 500
Batavia, IL. 60510
630-840-8898
dhoffer@fnal.gov

Vince Pavlicek
Fermi National Accelerator Laboratory
M.S. 368
P.O. Box 500
Batavia, IL. 60510
630-840-3257
vince@fnal.gov

Ed Temple, Jr.
Fermi National Accelerator Laboratory
M.S. 200
P.O. Box 500
Batavia, IL. 60510
630-840-6034
etemple@fnal.gov

William Wester
Fermi National Accelerator Laboratory
M.S. 222
P.O. Box 500
Batavia, IL. 60510
630-840-2113
wester@fnal.gov

Peter Wilson
Fermi National Accelerator Laboratory
M.S. 318
P.O. Box 500
Batavia, IL. 60510
630-840-2156
pjw@fnal.gov

Appendix E

DIRECTOR'S REVIEW OF THE
RUN IIb D-ZERO DETECTOR UPGRADE AFEII
April 13-14, 2005

Participant List

Reviewers
Jeff Appel
John Cooper
Dean Hoffer
Vince Pavlicek
Ed Temple
William Wester
Peter Wilson

D-Zero Presenters
Vivian O'Dell
Alan Bross
Jaun Estrada
Paul Rubinsov
Leo Bellantoni
Michael Hildreth
Jerry Blazey

Directorate
Jeff Appel
Hugh Montgomery
Ken Stanfield

Department of Energy
Paul Philp

Appendix F

Table of Recommendations

No.	Recommendation	Assigned To	Status/Action	Date
Question 1 –Performance Specification				
1.1	The committee recommends that a clear set of prioritized performance requirements be agreed upon by the project management immediately. These requirements should be driven directly by the physics requirements of the experiment and be easily measured on a teststand. This should be a short document (of order 1 page) which it should be easy to assemble from existing documentation. Without this set of requirements it will be difficult to evaluate whether the design is complete or not. These requirements can be used by the project management to set boundaries between modifications that must be made and those that fall in the "it would be nice" category. Given the very tight schedule it is imperative that only the required design modifications be made.			
Question 2 – Physics Case				
2.1	The MC studies of top and Z-Higgs should be redone quickly, and separately with each of the important performance degradations, some of which would be alleviated by a new AFE-IIt. We are thinking in particular of separately quantifying the gains from resetting every crossing, degradation of light yield, and low VLPC gain. This should help focus attention on only those changes			

No.	Recommendation	Assigned To	Status/Action	Date
	which have sufficient physics return for the effort and time required to make the implementation.			
Question 3 – R&D Work				
3.1	The module and chip requirements should be defined as recommended in item 1 above.			
3.2	Testing of the prototype modules must be completed as soon as possible.			
3.3	The prioritized list of design changes for production should be reviewed and pared as much as possible and implemented as soon as possible to ensure that the production schedule can be met.			
Question 4 – Cost Estimate				
4.1	The collaboration should increase contingencies to include a possible 2nd submission of the Trip-t chip in case of a problem with the submission. In addition, costs and/or contingencies should be increased to allow for flexibility to speed procurement orders. Particular emphasis should be placed on realizing the first tested AFE-IIt prototype board.			
4.2	The collaboration should develop a production plan quickly. In particular, consideration should be given to a plan that calls for the production of a much larger number of AFE-IIt boards. With a larger number of boards started, there would be more boards produced that require virtually no re-work.			
4.3	The committee recommends the following changes to the delineation of the required amount of contingency for the AFE IIt project. First, on the			

No.	Recommendation	Assigned To	Status/Action	Date
	M&S associated with the TriP-t production, the contingency should reflect the full cost of a potential re-submission in the event there is a layout flaw that requires re-fabrication. This re-submission is thought to cost $250K. Second, on the M&S associated with the entire AFE-IIt boards, a contingency of approximately $250K should be added to accommodate a possible change in strategy whereby an additional 100 boards are purchased in order to reduce the re-work required to realize 203 AFE IIt boards ready for installation.			
4.4	The committee also encourages sensible use of contingency funds to speed up certain procurements especially those involved with realizing the first AFE IIt prototype.			
Question 5 – Schedule				
5.1	The committee believes the AFE IIt needs essentially full time L2 managers – the current L2 managers could shed most of their other responsibilities, or perhaps another senior person could join the management to fill in the gaps. The management needs to focus strongly on their task – you are nearly out of time to complete this project and people have to be thinking full time about how to limit the project to the essentials and how to execute the production and testing quickly. Every shortcut has to be explored. At this point you may have to throw money at the problem, not look for ways to save money.			

No.	Recommendation	Assigned To	Status/Action	Date
Question 6 – Engineering Team				
6.1	The installation activities should have additional resources available so that installation tasks have minimal impact on testing. Additional collaborators should be recruited and trained for installation and commissioning tasks to ensure the testing schedule is met.			
Question 7 – Identification of Team				
7.1	Present the most recent studies of the potential physics gains associated with the AFE-IIt to the collaboration in a most visible forum, and seek the commitment of at least one additional group to bring the project to fruition in a timely way. Earlier and additional physicist involvement in testing, installation, commissioning, and tracking codes would benefit each of these areas - particularly in assuring timely benefit from the AFE-IIt.			
7.2	The technical team should provide the specific module difference information to the software team as soon as possible.			
7.3	The D0 SCIPC committee should review the AFEII commissioning plan as soon as possible to ensure that the project has the resources necessary for installation and commissioning.			
Question 8 – Commissioning Plan				
8.1	Emphasis should be placed on verifying that the AFE II prototypes are truly plug compatible with the AFE I boards. The ability to operate the system with mixture of boards will provide important			

No.	Recommendation	Assigned To	Status/Action	Date
	flexibility in commissioning the system.			
8.2	A plan for physics commissioning of the timing readout should be developed including detailed prioritization of the software tasks required for completion.			
Question 10 – Committee Recommendation on Approval				
10.1	In light of the potential benefit, the committee recommends that the Fermilab Directorate seriously consider approving the AFEII project. Should it be approved, progress should be closely monitored and appropriate steps, if possible, should be implemented to keep the project on schedule. A natural time to take a close look at progress will be in July or August after some tests of the prototype boards have been performed.			